II. Amendment to the Claims.

1. (Withdrawn) A continuous process for producing charcoal from biomass input material in which the production of charcoal is maximized and the consumption of charcoal is minimized, the process comprising the steps of:

a. establishing a charcoal production bed having a biomass upper layer having a top and a charcoal lower layer having a lower layer top; an intermediate layer pyrolysis zone positioned between the upper layer and the lower layer; the charcoal production bed positioned in a single reaction chamber;

b. igniting the lower layer top with ignition means;

establishing a pyrolysis zone at the intermediate layer;

c. moving oxygen-containing gas downwardly through the charcoal production bed to sustain the pyrolysis reaction in the intermediate layer and to maintain the temperature of the charcoal in the lower layer, wherein the pyrolysis volatiles from the intermediate layer move downwardly through the hot charcoal in the lower layer, resulting in tar-free fuel gas, which exits from the outlet means, and;

c. removing, by removing means, charcoal in the lower layer; regulating the introduction of additional biomass material so that as charcoal is removed, the level of charcoal comprising the lower layer, and hence the level of the pyrolysis zone comprising the intermediate layer, remain substantially constant within the reaction chamber.

2. (Withdrawn) The process of claim 1, wherein:

a. maintaining the lower layer at a temperature which is sufficiently high to reduce any tars from the pyrolysis zone intermediate layer to carbon monoxide, hydrogen;

c. providing the charcoal production bed with an outlet means for fuel gas; regulating the additional biomass material by regulating at least the quantity and or the

moisture content of the additional biomass material.

3.(Withdrawn) The process of claim 2, including the step of monitoring the level of the pyrolysis zone in the reaction chamber.

4. (Withdrawn) The process of claim 3 wherein the monitoring of the level of the pyrolysis zone in the reaction chamber is by thermocouple means.

5.(Withdrawn) The process of claim 2, including the step of removing the fuel gas from the reaction chamber.

6.(Withdrawn) The process of claim 1, wherein the temperature of the pyrolysis reaction zone is in the range of 800.degree. C.-1000.degree.

7.(Withdrawn) The process of claim 1, wherein the charcoal lower layer is substantially devolatilized.

8.(Withdrawn) The process of claim 1, wherein the charcoal lower layer is substantially uniform in size.

9. (Withdrawn) The process of claim 2, wherein:

a. establishing the charcoal production bed is commenced by adding a charge of charcoal at the lower layer of the reaction chamber.

10. (Currently amended) An apparatus for the production of fuel gas and charcoal

comprising:

a. a reaction chamber (30) ~~receiving biomass, including organic matter, thereby establishing a charcoal production bed; the charcoal production bed having a biomass upper layer having a top and a charcoal lower layer having a lower layer top; an intermediate layer pyrolysis zone positioned between the upper layer and the lower layer; the charcoal production bed positioned in a single reaction chamber; a pyrolysis zone established at the intermediate layer; tar-free fuel gas (44) produced as pyrolysis volatiles from an intermediate layer move downwardly through hot charcoal in the lower layer which exits from outlet means~~ which is generally cylindrical; the reaction chamber (30) comprising an upper layer (13), an intermediate layer (14), and a lower layer (15); delivery means (16), for introduction of biomass (20) into the reaction chamber (30); a light detection means (22), for the detection of biomass (20), is mounted by mounting means at a top (31) of the reaction chamber (30); the reaction chamber (30) is open at its lower end; the reaction chamber (30) receives air input (50) at an upper layer (13) and air is drawn down through the reaction chamber (30) by means of a pump (42) and fuel gas (44) exits from the apparatus; a removal means (45) for removal of charcoal; control of removal means (45) is by a temperature sensing means including thermocouples positioned in the reactor chamber (30); the temperature sensing means has an output received by a controller for the delivery means (16);

b. an outlet means (43), from the reaction chamber (30), for fuel gas (44) output is directed into a heat exchanger means (60) at a heat exchanger tank (60)~~;~~ and into a water or coolant reservoir (65); heat exchanger tank (60) exhaust is via a heat exchanger tank exhaust (71);

c. the heat exchanger tank exhaust (71) is directed into a demister means (80) at a demister input (81); the demister means (80) accumulates condensate (83); a demister

output (82) is directed into a fuel conditioner means input (110), through a bubble forming means (115) and into and through a fuel conditioner means (100) containing fuel means (120); a [the] fuel conditioner output (130) is exhausted via pump means (140) exerting a vacuum at the fuel conditioner output (130); fuel conditioner output (130) is directed to a storage or combustion at an engine means (160); demister means (80) is comprised of at least one tube (81).

11. (Currently amended) An apparatus of claim 10 further comprising:

a. the heat exchanger tank (60) ~~having~~ has a water or coolant supply inlet (67) and water or coolant discharge (69); the heat exchanger tank (60) containing water (65); fuel gas (44) is bubbled through the water (65) and exhausted from the heat exchanger tank (60) at the heat exchanger tank exhaust (71);

b. the demister means (80) is comprised of a demister tank (87) with the a demister input (81); ~~comprised of~~ the at least one tube (81) extending downardly toward a condensate (83) collector (85);

c. the fuel conditioner means (100) ~~containes~~ contains fuel means (120); the bubble forming means (115) is provided by directing a the fuel conditioner input means (110) via pipe or tube means (110) to and through a grid (116)formed of fine wire mesh or a plate with at least one aperture (117); the bubble forming means (115) is submerged beneath [a] the fuel means (120) surface (125);

d. the delivery means (16) may include hoppers, conveyors, augers and other such feed or delivery devices; light detection means (22) is an electric eye (22); the electric eye (22) provides a switch function electrically communicating with a motor drive for the delivery means (16) causing power to the motor controlled delivery means (16) when the electric eye (22) detects the absence of biomass;

e. the pump (42) is located in fuel gas outlet means (43);

f. temperature sensing means is provided by at least one thermocouple (24) at the upper layer (13)..

12. (Currently amended) An apparatus of claim 11 further comprising:

a. the heat exchanger means (60) is supplemented by a supplemental heat exchanger means (62); said supplemental heat exchanger means (62) is positioned within the heat exchanger tank (60) and is in fluid contact with [the] a heat exchanger water or fluid content (65);

b. the at least one tube (81) is comprised of a plurality of tubes 1...n (81); the condensate (83) accumulated in the demister means (80) is periodically drained from the demister means (80) by a condensate drain means (84) comprised generally of a valve and piping means discharging into a reservoir.

c. the delivery means (16) is by motor controlled auger (16)

d. temperature sensing means is provided by one or a plurality of thermocouples (24).

13. (Currently amended) An apparatus of claim 12 further comprising:

a. supplemental heat exchanger means (62) is comprised of a tube heat exchanger; fuel means (120) includes ~~but is not limited to~~ diesel, peanut oil, vegetable oils and other combustible substances for engine means (160) combustion~~/~~; pump means (140) exerts a vacuum at the fuel conditioned output (130) and fuel conditioner output (130) is directed to the [a] storage or combustion at an engine means (160);

b. valve means controls water or coolant supply inlet (67) and water or coolant discharge (69) and the condensate drain (84); pipe or tube means (75) provides fluid

communication from fuel gas (44) input to heat exchanger means (60), between heat exchanger means (60) and demister means (80)[;]__ between demister means (80) and fuel conditioner means (100) and between fuel conditioner means (100) and storage or engine means (160);

c. temperature sensing means is provided by three thermocouples (24) positioned respectively at the upper layer (13), intermediate layer (14) and at the delivery means (16).

14. (Currently amended) An apparatus of claim 13 further comprising:

~~a. the fuel conditioner output (130) is in the range of 5% to 20% diesel with the balance comprised of fuel gas (44);~~

a.[b.] conditioner means (100) having [a] the__ fuel conditioner means input (110) from the demister means (80) conveying fuel gas (44); the fuel conditioner means input (110) directing fuel gas (44) through bubble forming means (115) into and through [a]the fuel conditioner means (100) containing fuel means (120);

b.[c.] bubble forming means (115) is provided by directing the fuel conditioner input means (110) via pipe or tube means (110) to and through [a] the__ grid (116)formed of fine wire mesh or [a]the plate with at least one aperture (117)__.

15. (Currently amended) An apparatus of claim 14 further comprising:

~~a. the fuel conditioner output (130) will be diesel in the range of 5% to 10% and fuel gas (44) at 95% to 90%;~~

a.[b]. fuel means (120) comprised of diesel, peanut oil, vegetable oils and other combustible substances .

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16. (Currently amended) An apparatus of claim 15 further comprising:

a. the conditioned fuel gas (130) is be introduced directly into an [the] engine intake manifold

b. the removal means (45) is comprised of an auger, a valve controlled chute or a screw drive;

c. a thermocouple positioned in the reactor chamber (30) at the intermediate layer (14) will will provide switch means for the control of a motor controlled removal means (45) to move the intermediate layer (14) down in the reaction chamber (30); a thermocouple at the top (31) of the reaction chamber (30) will provide high temperature information for safety shutdown of the fuel gas pump (42); a third thermocouple at the delivery means (16) provides additional high temperature sensing and safety control for pump (42) control.

17. (Currently amended) An apparatus of claim 11 further comprising:

a. the water or coolant discharge (69) is discharged to a ~~reservior~~ reservoir for agricultural uses;

b. the charcoal removal system (40) is comprised of removal means (45) comprised of an auger, a valve controlled chute, screw drive and other lift or moving device and a conveyance or routing means (34) and charcoal storage means (36);

c. the reaction chamber (30) may be composed of heat and corrosion resistant materials including fiber-ceramic insulating material and interiorly lined with unreactive inconel or stainless steel metal; the reaction chamber (30) will have a circular cross-section.

18. (Cancelled) A process from the apparatus of claim 17 comprising:

a. collecting the water or coolant discharge (69); separating chemicals from said water or coolant discharge including potassium.

19. (Currently amended) The apparatus of claim 10 further comprising:

a. the upper layer (13) has a upper layer center (12) ~~relative to the upper layer (13) proximal a reaction chamber wall (32) and~~ proximal [a] the reaction chamber top (31);

b. biomass (20) is introduced into the upper layer (13) by means of a funnel means (200) which directs said biomass (20) toward the upper layer center (12);

c. a charcoal discharge funnel means (230) is formed intermediate the lower layer (15) and the removal means (45) which directs the charcoal away from walls (42) of ~~the~~ a charcoal removal system (40) and toward the removal means (45);

d. the funnel means (200) at the funnel side (220), relative to a vertical, and the charcoal discharge funnel means (230) at the charcoal discharge funnel slope (240) are sloped at greater than approximately 45 degrees.

20. (Currently amended) The apparatus of claim 19 further comprising:

a. the slope, θ (210, 240) of the funnel means (200) funnel side (220) and of the charcoal discharge funnel slope (240) are approximately 60 degrees; both the funnel means (200) and the charcoal discharge funnel means (230) are primarily inverted conical in structure;

b. the charcoal removal system (40) is comprised of removal means (45) comprised of an auger, a valve controlled chute, screw drive and other lift or moving device and a conveyance or routing means (34) and charcoal storage means (36).

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21. (Currently amended) The apparatus of claim 12, further comprising:

a. a charcoal heat exchanger means (260) provided by at least one tube (262) penetrating a [the] charcoal collection means (41) arena via a plurality of heat exchanger ports (264) at a charcoal removal system (40) having a ~~the~~ charcoal removal system wall (42);

b. the uppermost portion of the reaction chamber (30) is slightly flared to accommodate a head of biomass (20);

c. the reaction chamber (30) may be composed of heat and corrosion resistant materials including fiber-ceramic insulating material and interiorly lined with unreactive inconel or stainless steel metal; the reaction chamber (30) has a circular cross-section.

22. (New) An apparatus to produce fuel gas from biomass, comprising:

a single reaction chamber comprising a charcoal production bed and a delivery means wherein said delivery means is functionally connected to a source of raw, unprocessed biomass; and further wherein said charcoal bed comprises three vertically identifiable layers – an uppermost layer of raw, unprocessed biomass; an intermediate layer comprising a pyrolysis zone; and a lowermost layer of charcoal, said charcoal comprising spent biomass;

a charcoal removal system comprising a mechanical conveyance means, comprising an independent motor and temperature-activated control mean, functionally connected to said single reaction chamber;

said apparatus to produce fuel gas from biomass further comprising a filter

wherein said filter is functionally and physically connected to said single reaction chamber by pipe gas exit means, and said filter further being functionally connected to a heat exchanger by pipes, said heat exchanger comprising a heat exchanger tank, a coolant fluid, coolant fluid inlet and a coolant fluid discharge, wherein, said heat exchanger discharge physically joins said heat exchanger tank to a demister element, said demister element comprising a demister tank and demister input, said demister input comprising at least one tube and a condensate drain, and further comprising a demister element output pipe, said demister element output pipe being functionally and physically connected to a fuel conditioner element;

said fuel conditioner element comprising a tank element, a bubble forming element positioned near the bottom of said tank element, a fuel fluid, and a fuel conditioning means discharge pipe;

and, said apparatus to produce fuel gas from biomass further comprising a pump means positioned on said apparatus to produce fuel gas from biomass, such that the flow of air is vertically downward from the top of said reaction chamber with a controlled flow volume and such that said pump generates a pressure differential so that fuel gas flows from said intermediate layer through said filter, said heat exchanger means, said demister, and said fuel conditioner to said initial storage point.

23. (New) the apparatus to produce fuel gas from biomass of claim 22, wherein said coolant fluid is water.

24. (New) the apparatus to produce fuel gas from biomass of claim 22, wherein said coolant fluid is a mixture of water and any antifreeze fluid.

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25. (New) the apparatus to produce fuel gas from bimass of claim 22 wherein said coolant fluid is a mixture of water and an alcohol.

26. (New) the apparatus ro produce fuel gas from biomass of clain 22 wherein said fuel means is diesel fuel.

27. (New) t he apparatus to produce fuel gas from biomass of claim 22 wherein said fuel means is any combustible vegetable oil.

28. (New) the apparatus to produce fuel gas from biomass t)f claim 22 wherein said fuel means is any combustible, liquid fossil fuel.

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